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Preliminary Phytochemical and Pharmacognostic Studies on a Well-known Medicinal Plant *Glycyrrhiza glabra*

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Research Article

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Abstract

Glycyrrhiza glabra is a perennial herb in the subtropical and warm temperate regions. The principal constituent of licorice is glycyrrhizin. Licorice is used for the treatment of asthma, acute and chronic bronchitis and chronic cough. It modulates the immune system and has remarkable immuno-stimulant properties. The phyto-constituents like glycyrrhizin and glycyrrhizinic acid, triterpenoid glycosides (saponins), flavonoids (including liquiritigetol) are potent components for health benefits. It is a mild anti-inflammatory for arthritis and rheumatism and is used to treat gastric, duodenal and esophageal ulceration of inflammation, heartburn and mouth ulcers. Since it has got so many pharmacological activities it is important to standardize this drug, hence the present study.

Keywords: Phytochemistry; Pharmacognosy; Licorice; Glycyrrhiza glabra; Medicinal plant

Introduction

Glycyrrhiza glabra is wide spread in Mediterranean, Southern and Central Russia and Asia, being minor to Iran. It belongs to family Fabaceae. Synonyms are *Liquiritae officinalis* Moench, *Glycyrrhiza glabra* subsp. *glandulifera* (Waldst. & Kit.) Ponert, *Glycyrrhiza pallida* Boiss. Noe, *Glycyrrhiza violacea* Boiss. & Noe. It was one of the most widely known medicines in ancient history, and records of its use include Assyrian tablets of around 2000 BC and Chinese herbals of the same period. Theophrastos of Lesbos, writing in the fourth century BC wrote that 'it has the property of quenching thirst if one holds it in the mouth'. Dioscorides gave the plant its botanical name (Greek glukos = sweet, riza = root). Its 13th century English name was Lycorys, a corruption of Glycyrrhiza. Liquorice (*Glycyrrhiza glabra*) has long been used for both culinary and medical purposes.

Natural licorice can be effective medicine. For over 3000 years, licorice root has been used as a remedy for peptic ulcers, sore throats and coughs in eastern and western medicine. Licorice root has been used since the third century BC to help dissipate coughs. Licorice is the most widely used "drug" in the world due to its volume of consumption in China. In India, it is cultivated in some parts of the hilly northern area, Delhi and South India. A number of components have been isolated from licorice, including a water-soluble, biologically active complex that accounts for 40-50 percent of total dry material weight. This complex is composed of triterpene saponins, flavonoids, polysaccharides, pectins, simple sugars, amino acids, mineral salts, and various other substances [1]. Glycyrrhizin, a triterpenoid compound, accounts for the sweet taste of licorice root. This compound represents a mixture of potassium-calcium-magnesium salts of glycyrrhizic acid that varies within a 2-25 percent range. Among the natural saponins, glycyrrhizic acid is a molecule

composed of a hydrophilic part, two molecules of glucuronic acid, and a hydrophobic fragment, glycyrrhetic acid [1]. The yellow color of licorice is due to the flavonoid content of the plant, which includes liquiritin, isoliquiritin (a chalcone), and other compounds [2]. The isoflavones glabridin and hispaglabridins A and B have significant antioxidant activity and both glabridin and glabrene possess estrogen-like activity [3,4].

Glycyrrhiza as a Natural Sweetener

The major sweet principle of licorice root, glycyrrhizin [G, glucuronobioside of glycyrrhetinic acid (GA), content: nearly 4%], has been used as a sweetener and a flavor enhancer in foods and also as a medicine [5]. A variety of 3-O-glycosides of glycyrrhetic acid was prepared and its sweetness evaluated from glycyrrhizin (1, the saponin of licorice root, relative sweetness to sucrose: x170). It was found that a significant enhancement of sweetness was observed for the 3-O-beta-D-xyloside and the 3-O-beta-D-glucuronide (MGGR). Especially, MGGR had a high sweetness relative to sucrose; x941, and would appear to be a new potent sweetener [6].

Materials and Methods

Voucher specimen: The plant material Rhizome of *Glycyrrhiza glabra* was collected from the wild and Identity was confirmed with the voucher specimen using Gamble, et al. [7].

Organoleptic & Physico-chemical values such as the percentage of total ash, acid-insoluble ash, water-soluble ash, and water and alcohol-soluble extractives were calculated as per the Indian [8]. Physico-chemical values such as the percentage of total ash, acid-insoluble ash, water-soluble ash, and water and alcohol-soluble extractives were calculated as per the Indian Pharmacopoeia [8]. TLC fingerprinting profile carried as per Stahl E, et al. [9]. For the Anatomical studies, transverse sections (TS) were prepared and stained [10,11]. A standard, Limit for total microbial count provided by WHO Guidelines was followed and also Indian herbal pharmacopoeia.

Results and Discussions

Sl. No	Sample	Color	Texture	Odor	Taste
1	Licorice (bark)	Light Yellow	Coarse	pleasant	Sweet

Table 1: Organoleptic Characters.

Sample name	Total Ash content (%)	Acid insoluble ash (%)	ASE (%)	WSE (%)
Licorice (bark)	5.6187	1.325	4.08	18.9
Limits(IHP)	NMT 10%	NMT 2.5%	NLT 10%	NLT 20%

IHP-Indian Herbal Pharmacopoeia NMT-Not more than NLT- Not Less than.
Table 2: Physicochemical Parameters.

Figure 1: Anatomy of Licorice rhizome.

Anatomical Characters

Ten to Twenty or more layers of tubular cells in cork, outer layers contain reddish brown amorphous matter and the inner layers show thick walled colorless cells. Phellogen is indistinct. Phelloderm, one to three layers of radially arranged parenchymatous cells containing prisms of calcium oxalate and few starch grains.

Secondary Phloem

Phloem fibers thickened cellulosic walls in the inner side and lignified cells outer side. Fibers concentrically arranged in bundles of 10-50. Each bundle is surrounded by parenchymatous sheath containing calcium oxalate crystals. Phloem parenchyma cells thin walled with starch grains and calcium oxalate. Medullary rays distinct, bi-

multiseriate parenchymatous cells, narrow in the xylem region and wider in the phloem region. Calcium oxalate crystals are present in few cells. Thin walled cells are present in cambium and are 3-more layered. Secondary xylem consists of vessels, xylem fibers and xylem parenchyma.

Powder Microscopy

Powder microscopic characters are very important in Ayurveda for the proper identification and authentication of plant materials during drug standardization.

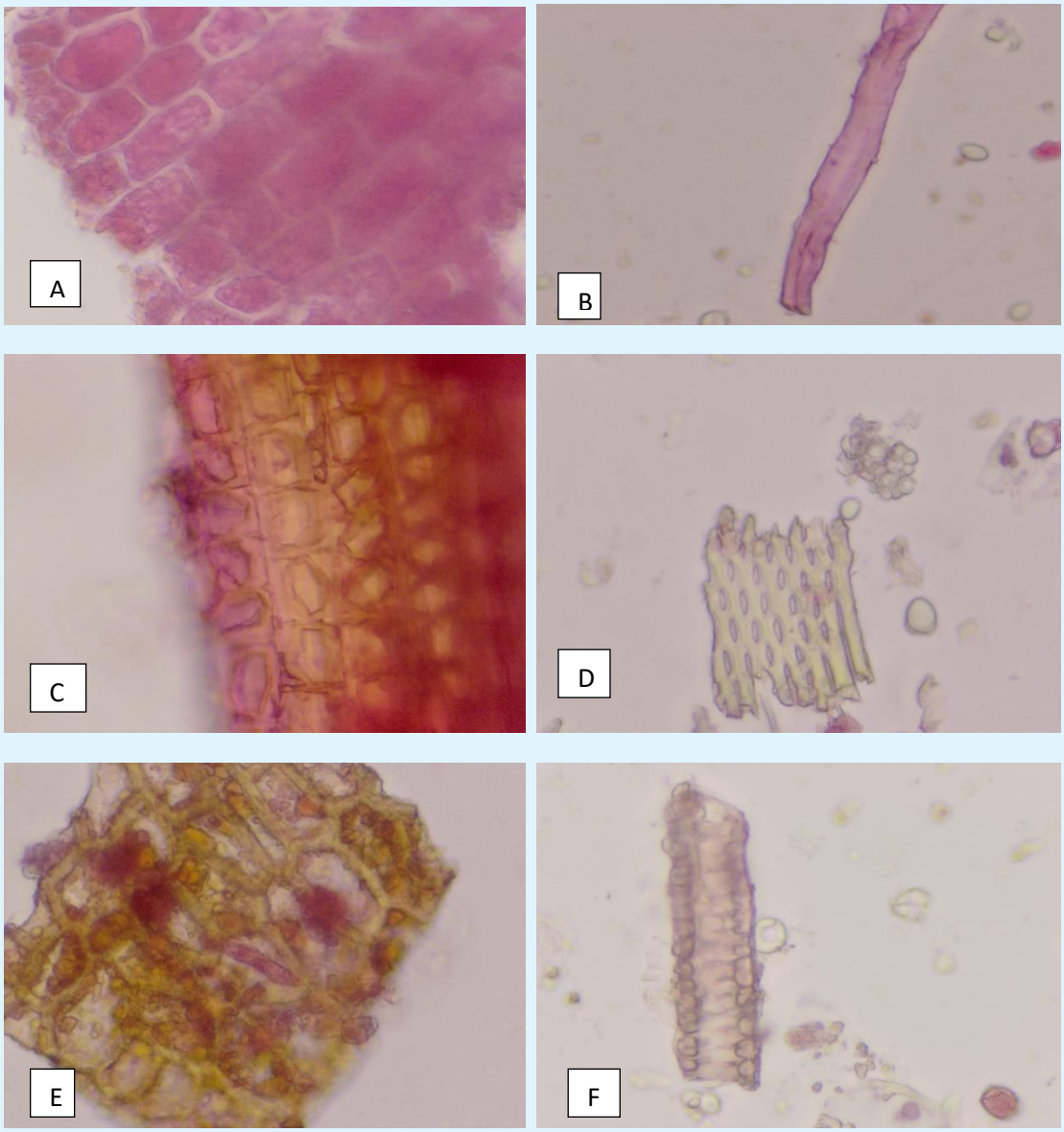

Figure 2: Powder characteristics of licorice A- Cork in surface view, B- Part of single fiber, C- Group of fiber with incomplete calcium oxalate prism sheath, D- Fragment of large vessel with elongated pits, E- Collenchymas from the cortex, F- Part of a group of smaller vessels with bordered pits.

Sl. No	Solvent	Visible	UV
1	Ethanol	Light yellow	Light brown
2	Methanol	Yellowish orange	Mustard
3	Toluene	Light yellow	White
4	HNO_3	reddish brown	Dark orange
5	H_2SO_4	Dark red	Mustard
6	HCl	Orange	Mustard
7	Water	Dull yellow	Mustard

Table 3: Powder Analysis of Licorice after Treating with.
This is useful in standardizing when powdered drug is supplied or procured from the market.

Sl. No	Phytochemicals	Test	Observation	Results
1	Phenols	Phenol test	Intense color	+
2	Flavonoids	Shinoda test	Yellowish brown color	+
3	Steroids	Salkowski test	Red color	+
4	Triterpenes	Salkowski test	Yellow color	
5	Saponins	Foam test	Foam	+
6	Alkaloids	Meyer's test	Creamy white precipitate	+
7	Lignans	Labat test	Olive green color	-

Table 4: Preliminary Phytochemical analysis of Licorice.

TLC studies on Licorice: The methanolic extract of Licorice was used for TLC profile and Solvent used was Toluene: Ethyl acetate (8:2).

The TLC profile shows various bands in all the Medias. Only 2 bands were seen in visible light and 8 bands were observed when plates sprayed with 10% H2SO4 and Anisaldehyte. When observed under Short UV (254nm) and long UV (366nm) 5 and 4 bands were observed respectively.

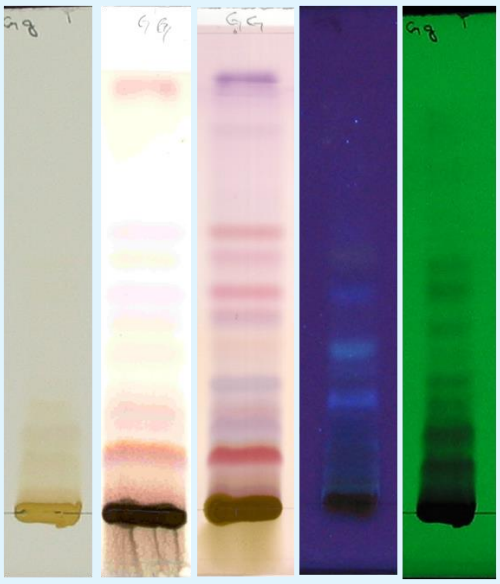

Figure 3: ABCDE TLC Images.

A. Under Visible Light								
Rf Values	0.03	0.17	-	-	-	-	-	-
B. Sprayed with 10% H_2SO_4								
Rf Values	0.04	0.13	0.21	0.34	0.41	0.46	0.53	0.59
C. Sprayed with Anisaldehyde								
Rf Values	0.03	0.12	0.19	0.28	0.42	0.46	0.6	0.81
D. Under Short UV (254 nm)								
Rf Values	0.1	0.16	0.23	0.28	0.46	-	-	-
E. Under Long UV (366 nm)								
Rf Values	0.05	0.22	0.32	0.45	-	-	-	-

Table 5: TLC Finger Printing Profile Values.

Conclusion

Herbal drugs shows lesser side effects and are cost effective, thus the plant is shortlisted based on the symptomatic diagnosis which include Anti-diarrheal, Anti-inflammatory, Anti-constipation and Anti-spasmodic effects. The folk and ethno botanical use of (Licorice) showcases activities for treating diarrhea and abdominal pain. The plant under study exhibited the physicochemical properties viz Ash and Acid insoluble ash, which are almost similar or near to the limits mentioned by Indian Herbal Pharmacopeia (IHP) whereas ASE is very less than the limit mentioned and WSE is almost near to the limit mentioned in IHP, Which clearly indicates that chloride and silica presence in these plants is normal and with consumable range. The microscopic characters are unique and can be used as identifying markers for the above plants, separation of bands was observed when sprayed with various reagents, when observed under UV and also visible light. According to the microbiological studies the plant samples and extracts fall within the limits as prescribed by WHO and IHP.

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